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GEOGRAPHY IN CITY HIGH SCHOOLS *

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WHAT is the present situation in this country with respect to geography in the high schools?

1. Ninety per cent of the students who enter normal schools and colleges are deficient even in the elements of general geography, a condition which has no adequate defense.

2. The physical geography of the high school does little to improve this condition so far as a knowledge of general geography is concerned.

3. Geography is discontinued too soon in the grades. St. Louis, for example, reports that only 4.8 per cent of the recitation hours of its elementary schools is given to geography.

4. The physical geography of the past generation has not proved wholly satisfactory, and is being replaced by the so-called humanized geography. It is feeling the effect of the socializing of the curriculum.

On the other side of the situation appear the following facts:

1. Geography as a college study is developing rapidly, and trained teachers for the high schools are becoming available, a condition which has only lately existed.

2. There is a growing interest in geography among educated people generally both evidenced by, and helped by, the great circulation of the National Geographic Magazine and shown by the increase in geographical societies, and their activities.

3. Textbooks in humanized geography have already been issued and have been heartily received, and there is a demand for even a further emphasis upon applied geography in high school texts.

4. The geographical element in other branches of learning is receiving increased recognition. For example, the U. S. Department of Agriculture has trained geographers at work on the preparation of an Agricultural Atlas of the United States. The Carnegie Foundation has historians and geographers at work on an Atlas of American History. The Geological Surveys of Wisconsin, Illinois, and some other states are issuing geographical as well as geological reports, especially for educational use.

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5. Geographical knowledge is an essential part of an education and upon its own merits will command and hold a place in the schools. But behind any study there must be an organized body of teachers to guide its development and maintain an *esprit de corps*. The conviction is growing that there must be a national organization of geography teachers as there is of history teachers, English teachers, Latin teachers, etc.

Geography An Integral Part of a High School Course

But why is geography an integral part of a high school education?

American History, Ancient History, Mediaeval History, Modern History are all taught and believed in. These are records of what peoples and nations did yesterday and the day before. But is a knowledge of Germany of the 16th century more valuable than a knowledge of Germany of the 20th century? Any study of nations and peoples which omits their study as they are today is manifestly dictated by tradition, not by the needs of people. History is one of the most broadening studies in the curriculum, but there is no defense for ending the study of countries with the 19th century. To him who would be an intelligent actor in the world's affairs today, the political and economic geography of today is one of the most practical of studies.

Four Aims of High School Geography

There are at least four things which must be accomplished by a high school course in geography. First, it must give the pupil a fund of useful geographical knowledge; the kind that will serve him in the various activities of life where intelligent citizenship is required. We shall find it difficult to defend the teaching of the causes of the Peloponnesian War, the details of the Amphictyonic Council, and scores of similar matters of ancient and mediaeval history, which we drill into school children, while, at the same time we excuse a school which makes no serious effort to give its pupils an understanding of *modern* Germany, Japan, or Argentina. The life and industries of the people of Babylon and Thebes is a proper subject of study, but it is not a substitute for a knowledge of modern Mexico, Canada, or Russia. Before an impartial jury what defense has the study of the 2000-year old struggle between Sparta and Athens or between Persia and Greece, for crowding out of our schools anything like an adequate treatment of the countries which dominate the world today? The geography which is going to be demanded tomorrow is the geography which makes people reasonably intelligent about the cities and countries and peoples of their own day, as well as of those of long ago. This is politico-economic geography. It is a social science, but it will, I hope, be built upon a knowledge of the principles of physical geography. In Germany, France, Holland, Austria, Switzerland and Scandinavia, geography is nearly always closely affiliated with history and is often taught by the same teacher.

(2) If the first requirement placed upon the study of geography is a knowledge of the facts about the peoples and nations of today, a second is acquainting students with standard sources from which such facts may be gleaned. The text book is normally the main source of the facts studied in the class, but that is not enough. We shall miss our duty if we do not teach pupils where these and additional facts, frequently revised, may be found. The course in geography should train the pupils to use the atlas, the encyclopedia, the gazetteer, the Statistical Abstract, the census reports, the Statesman's Year Book, and perhaps the World Almanac. If these sources are consulted in the regular routine of study, their use grows into a habit, and it is a good habit.

(3) The constant use of maps, the careful study of maps, and the occasional making of maps is an integral part of a course in geography. One of the very most valuable assets which any one may derive from geography study is a collection of clear mental pictures of the maps of the world and its principal countries; mental map pictures which we may call up at will. If geography does not give us those pictures it has failed at one of its critical points.

Geography teachers, if you have not a collection of wall maps for your class room, give your principal no peace until you get them. As well try to teach literature without books as geography without wall maps. There is one greater sin than not having wall maps; that is not using them when you have them. Out of this map-study grows a knowledge of locational geography. At present locational geography is a vulnerable spot in the high school student's mental equipment. Yet there is probably no one phase of geography which is so useful as map knowledge,—knowing where places are. That our fathers and mothers had to learn 300 capes and bays, is scarcely a reason why their grandchildren should not learn any. Every geography teacher should have a list of countries, cities, rivers, seas, mountains and other geographical features which she deems of real importance, and she should then see that no pupil escapes from her custody until he knows where those places are and at least one good reason why every item in the list deserves a place there. The Springfield, Illinois, schools have adopted such a list for the grades. Professor D. C. Ridgley of the Normal University of Illinois is working on such a list. The Springfield list was published in the June, 1914, Journal of Geography.

(4) So much for the knowledge of facts, of sources, and of maps. A fourth purpose must be to impart a knowledge of and an appreciation of geographical causes or influences. This is the substance of rational geography. It has appeared so constantly of late in the literature of geographical pedagogy that I need say little more about it. The causal idea is recognized as the keynote of modern scientific geography, but its emphasis belongs more to the advanced than in the elementary stages of the study. Woven into the

very warp and woof of good teaching will be this causal relation which pervades geography; yet it is also well to remember that geographical causes always work in conjunction with many other causes. The location and growth of New York or Minneapolis are due partly, not wholly, to geographical influences. Pupils should know that geographical influences are real, and that they often determine men's decisions in locating factories or railways or towns, but that after all, men, not geographical influences, are the active forces. Indians and Eskimos do not react to geographical suggestions as Anglo-Saxons do.

In What Year Shall Geography Be Taught?

If we were to lay out a course of study in geography for a large high school, upon what lines should it be built? In what year of the high school should it be placed? At present it is most often taught in the first year. Next most frequently, in the second year and less often in the third or fourth year. The Committee of Ten favored placing physiography of an advanced type in the fourth year, because the study is best handled after pupils have learned something of the other sciences. We should like to place most of our studies late in the course, but that is impossible. As a practical plan, geography must be offered in the first or second years, but it would be a fine thing if in the big schools a class might also be offered in the senior year, taught by a teacher trained in geography, in history and in economics, one who could effectively handle the study as a blended physical and social science.

The Course In High School Geography

In this country we are already committed to a type of geography which is a combination of physical and applied geography. Geographers are practically agreed that the first half year of the course must teach the essentials of physical geography. They are not a unit, however, regarding the most appropriate phase of applied geography for the second half year. Of the two most recent text books, one has adopted regional geography of the world for the second half-year's work; the other devotes its latter chapters to such topics as: Inland Waters as Related to Navigation, Irrigation, Power and Water Supply; Mountains and Plateaus and their Relations to Life; Plains and their Relations to Life; Coast Lines and Harbors; The Industries of the United States; Distribution of Population and Cities. A still different arrangement consists in using a textbook in physical geography the first semester and a textbook in commercial geography the second.

While not *strongly* favoring one of these plans above another, I am conscious of a preference in the matter. It may be only a temporary preference but it has been growing upon me. My leaning is toward a course which combines some things from each of the plans just mentioned. I cannot get away from the conviction that the high school pupil ought to have an opportunity to study, in a more mature way than he can do in the grades, the poli-

tico-economic geography of the nations which today dominate the world's affairs. In a sense this is regional geography, but the regions to be studied are nations, rather than physical or climatic provinces. The physical or climatic province is possibly a more logical, more scientific, unit but it is not much used outside of school books. In the world of men and affairs Russia, for example is a single geographical unit, Germany another, and France another. Everybody thinks of them as units quite irrespective of the climatic or physiographic provinces which they may include or which may include them. Everywhere in real life, the political divisions are the ones that count in our thinking, our reading and our loyalty. Virginia includes parts of several physiographic provinces—the Coastal Plain, the Piedmont, the Blue Ridge, the Great Valley, and the Allegheny Plateau, yet to the Virginian, the thing that counts is Virginia, his state. The Canadian or the Mexican boundary line and most of our state lines are more significant boundaries than are the boundaries of the Coastal Plain or of the Great Basin or of any other physiographic or climatic provinces. In regional geography, the study of the political divisions of the world is at the present time my preference. This does not preclude the recognition and the study of natural divisions quite irrespective of political boundaries. He who prefers a different plan has the same right to his preference.

Details of the Course

Had I Aladdin's lamp and its power to summon up the Genii, this is, in general plan, the sort of course I think I should command him to prepare for a class in geography in the city high school (I reserve the privilege of changing my mind, however). It should provide for a map-study review of the essentials of the locational geography of the world. It should devote from 1/3 to 2/5 of its time to those parts of physical geography which time has shown to be of real interest and of practical value. Geography is by common consent not the study of the physical and untenanted earth nor is it the study of contemporary history; it is the study of the physical earth inhabited by people. The text book should contain problems calling for thought, questions for testing, and questions for review. The great majority of teachers who use our high school texts are not trained in geography; many of them have never studied it beyond its elementary phases, and they need all of the help the book can give them. I never knew a teacher who felt insulted because the author placed questions in the book. Reviewers sometimes say they are an insult to the teacher. The experienced teacher need not use them unless she wishes. They do her no harm and they do help the other teachers. There should be some sort of practical exercise or laboratory exercise, in every chapter if possible. There should be a section devoted to the Industrial Geography of the United States and the final two-fifths of the book should treat of the countries, the nations of the world, working under the limitations imposed by their physical environment, and actuated at least in the present age, mainly by economic motives.

Geography, then, in its modern sense ought to consist of (a) a study of the essentials of physical geography and the physical conditions and resources of those parts of the globe which the leading nations occupy; (b) the geographical study of mankind acting as organized political groups or nations; (c) the interaction of the people and their environment—the nations working for political and economic advancement, but mainly concerned with the development of industries and commerce.

Topics In Physical Geography That Deserve Emphasis

For the sake of definiteness, it is undoubtedly better to study the main principles of physical geography in the first semester. Pupils need to understand:

(1) The simpler planetary relations of the earth including dimensions, movements and their consequences, gravity, magnetism and the distribution of land and water on the earth.

(2) They need to understand in an elementary way the character and composition of the earth's crust—the two main origins of its rocks and the mineral resources contained within these rocks. They ought to know something of the underground processes by which iron, coal, copper, gold, salt and petroleum have been concentrated in places and thereby have become of value to man.

(3) They should know how weathering is accomplished, how soil is made, transported, enriched, and depleted, including the work of bacteria. Along with this must go a brief consideration of the great industry of agriculture.

(4) They should learn of the movements and functions of the underground water,—vastly more important to man than any other resource in the earth's crust except the soil itself, and the two so interlocked in function that each is useless without the other.

(5) They need to know how the earth's surface is eternally modified by forces acting within and without. The forces which modify the earth from within—forces burdened with the discouraging names of Diastrophism and Vulcanism, need only brief treatment. The eroding, transporting and depositing agents,—wind, water, and ice, need, fuller consideration. Growing out of this topic naturally comes the study of rivers and valleys in their varied relations to man; their relation to transportation, to water power, to agriculture, to location of cities, etc. In the study of rivers concreteness should be sought: study, not rivers in general, but specific, typical rivers: for example:

The Nile and Egypt
The Ganges and India
The Yangtse and China
The Amazon and Brazil
The St. Lawrence and Canada
The Volga and Russia
The Danube and Austria-Hungary.

So closely are these rivers related to the very life of these lands, that their study is geography in the best sense.

(6) Then must come some knowledge of the great land forms that have resulted from the operation of these geologic and physiographic forces: The mountains, the plateaus, the plains, with the emphasis strongly placed, not upon the physiographic but upon the ontographic side.

(7) The atmosphere and climate are entitled to a fifth or a fourth of the time of one semester, some teachers would say even more.

(8) The oceans merit less time than either the lands or the atmosphere. The tides can not be adequately taught in the high school and it is doubtful if any attempt at their explanation is really justified except by tradition. Ocean currents are deserving of attention chiefly in connection with climate and for the purpose of correcting some of the false ideas that are frequently taught in the elementary school.

(9) The distribution of plants, animals and races over the earth has always seemed to me to be perfunctorily taught and of no great value.

It is my conviction that in nearly every topic, physical and applied geography should go hand in hand. For example, weathering, soil, and agriculture go together; or stream erosion, valleys and life in valleys; all of which are so closely related that they ought to be considered together. While the principles of physical geography form the groundwork of the first semester's study, constant application of these principles to man's life on the earth is also demanded.

Consideration of Method of Teaching

But what of the method of teaching high school geography?

Some years ago when we were teaching only the physical aspect of the subject we classed geography with physics, chemistry and biology and regarded it as a laboratory science. Laboratory manuals were published and in a considerable number of large cities, school buildings were equipped with geographical laboratories. In the relatively few schools which had teachers prepared to carry on formal laboratory work, a reasonable degree of success was attained. But the movement did not gain headway and seems to have lost ground with the growth of the demand for humanized geography. Laboratory work in college geography is, on the other hand, increasing in its effectiveness. Friends of physical geography have always held that it is essentially a field study and that the laboratory is a very unsatisfactory substitute for the field. Geikie has said that one hour of instruction in the field is worth 20 hours of listening to lectures. His ratio of 20 to 1 is pretty high but the general principle no one can deny.

We all recognize how hard it is to do field work with city classes. There are a dozen genuine difficulties, yet field work can be done and is done. Not long ago John Mellish, a farmer boy in Cottage Grove, Wisconsin, wanted to study astronomy. He had had little schooling, had no

telescope and no observatory. Yet under difficult conditions he acquired the knowledge, he actually made a highly effective telescope, grinding the lens himself, and with it made discoveries of such importance that they brought him in one year two American medals and one foreign medal; which merely suggests that difficulties are designed to deter the timid and half-hearted, but not the resolute.

With the increasing emphasis which is now being placed upon geography as a social science, there is a decline in the demand for formal laboratory and field work. This does not mean that practical exercises, problems, map work, drawing and platting are not an essential part of humanized geography, for they most emphatically are.

In addition to the preparation of text book assignments, each pupil ought to work out with care two or three special topics; this is a work which not only acquaints him with sources where materials are to be found, but it gives him training in the organization and presentation of topics, a training which often proves more beneficial than the knowledge itself. This independent, constructive work ought not be omitted.

SUMMARIZING—

This paper is a plea for a full year of geography in the high school, taught as a combined physical and social science, taught by a teacher who has a knowledge of modern history and economics and a considerable knowledge of the earth sciences. It is a plea for work in sane physical geography with field studies, followed by a study of regional geography in which the regional units studied are the ones recognized in the bigger world beyond the school room, namely, the countries or nations which make up the modern world and in which all educated people are interested; a study of the politico-economic geography of the British Empire; the German, the Russian, and the Japanese Empires; of France, and China, Italy, and Austria, and our sister republics to the south; a study of their material resources, of their industries and institutions, their people, their cities, their political alliances, and the basic reasons which make them what they are in the family of nations; this with much use of maps, with an emphasis upon locational geography with training in the use of reference books, training in the preparation and presentation of topics, and a constant drill on essential principles and ideas. But all of it to be done in an elementary way befitting the youth of the pupils. This outline may sound like a post-graduate course in a university and such it might be, for geography, like history, is either an elementary or an advanced study, depending upon the manner of treatment.

France produces more potatoes than all North America, and Germany produces more than all of the world outside of Europe. Forty per cent of the German crop is fed to stock, and only 28 per cent is used for human food.

CRATER LAKE

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OF the many wonderful scenic features of our country, few are more interesting or more beautiful than Crater Lake. In addition to its great beauty, the lake enjoys the distinction of being the only one of its kind in the United States and of being the deepest lake within our borders.

In 1853 Crater Lake was discovered. Thirty years later the United States Geological Survey sent out the first party to study it. A considerable area, including the lake, was created a national park in 1902. Owing to its distance from a railroad, the lake has not, until quite recently, been visited by many people.

Crater Lake is situated about 65 miles north of the northern boundary of California and is in the midst of the beautiful Cascade Mountains in the southern part of Oregon. Intending visitors to Crater Lake, if starting on their trip from points in California, should leave the main line of the Southern Pacific Railroad at Weed, California, and proceed by a branch line to the city of Klamath Falls which is very picturesquely situated upon hills at the head of Lake Ewanna, about 15 miles from Lower Klamath Lake. In the vicinity of Lower Klamath and Tule Lakes we see thousands of acres of reclaimed swamp lands which form a part of the Klamath Project.

A bus ride of about fifteen minutes' duration lands passengers at the lower end of Upper Klamath Lake. After a most interesting boat trip of some three hours, the famous Pelican Lodge is reached. This is located on Pelican Bay, at the upper or northern end of the lake. In many places the mountains rise abruptly from the water and are fairly well wooded. Lava flows are seen at several points. To the west the sharp summit of Mount Pitt is plainly visible. Great white pelicans with their black-tipped wings are numerous and trout leap from the water at frequent intervals as the boat proceeds.

From Pelican Bay Lodge automobiles run directly to the rim of Crater Lake by way of Fort Klamath. The distance is about 40 miles. Much of the country in this vicinity is a very fertile plain which is in part due to the constructive work of glaciers and to deposits made by Anna Creek, Sun Creek, and Williamson River. These streams flow into Klamath Lake. Many of the farmers are Indians who live in quite substantial houses. In the early autumn whole families take up their abode in the huckleberry districts, camping there and gathering the fruit for winter use.

From Fort Klamath the road runs northwest to Crater Lake, a distance of about 20 miles. A few miles out of the town we enter a beautiful forest which continues to the end of our journey. The road swings in graceful curves among the stately firs and pines and at every turn some new beauty is presented. Here a grouse whirs from the cover of the roadside bushes

and flattens himself upon the limb of a tree. There a gaudy flicker wings his way to a new feeding place high up in a yellow pine. A company of magpies occupy a small open space. With their long black tails, black heads and white breasts, they are quite attractive. About half way between Fort Klamath and the rim of the lake we enter Crater Lake National Park. At the most favorable places within the park a speed of 15 miles per hour is permitted. Drivers of automobiles must give all other vehicles the right of way.

For several miles the road follows close to the rim of Anna Creek Canyon. This is a narrow canyon several hundred feet in depth. By walking a few rods from the auto, very impressive views of erosion columns can be had at a number of points.

Although there is a steady climb, the grades are not steep until we reach a point about three-fourths of a mile from the rim. In most cases automobiles go right to the summit, however. As we swing up on to the rim a most wonderful sight meets out gaze. Here, on the top of an immense truncated mountain, is a great bowl-like depression about five miles in diameter, holding a lake of marvelous blue. The walls of this circular depression are nearly vertical and rise above the water to altitudes varying from 500 to 2200 feet.

Nearly due north of us and about two miles distant, is a small conical island wooded to its summit. Its form at once claims our attention for it is strongly suggestive that the mountain is of volcanic origin. Here and there along the rim of the lake a peak or cliff rises above the general level. Llao Rock on the north, Glacier Peak and the Watchman on the west, on the south, Garfield Park, Vidae Cliff and Dutton Cliff and on the east, Cloudcap, are each a little more than 8000 feet in altitude.

No river flows into Crater Lake and there is no surface outlet. The source of the water is the precipitation that takes place over the 20 square miles which make up the surface of the lake and the small amount derived from the inner face of the rim. Considerable water escapes through the shell that surrounds the lake and some of this comes to the surface in the form of copious springs in the vicinity of Fort Klamath.

The outer slope of the rim is quite moderate, averaging from ten to fifteen degrees. The inner slope, as has been stated, is in most places practically vertical. From the lodge on the rim of the lake, a steep trail leads down to the water, the elevation of which is 6177 feet, or only sixteen feet less than the altitude of the summit of Mount Washington. The descent can be made in twenty minutes but twice this length of time should be allowed for the return trip. Only a few miniature beaches are found. At the foot of the trail some tiny rills deposit their loads of waste when it rains and when snow is melting and here is space for a small launch and two or three row boats.

A pull of thirty minutes will take one by row boat to Wizard Island,

the cone above referred to. As we row, the blue of the water is a constant marvel to us. The clearness of the water is remarkable also, being equal to that of Lake Tahoe. If we were to take the soundings, the depth of the water would be another source of surprise. If at any one of many points in the lake the highest building in New York City were placed and upon this the Eiffel Tower were erected, the top of the tower would be about 200 feet below the surface of the water. Few of the soundings taken have shown a depth of less than 1000 feet, eighteen show a depth of more than 1900 feet and the maximum depth recorded is 1996 feet. Thus the greatest depth from the rim to the bottom of the lake is practically 4000 feet.

Observations of temperature have shown that the temperature of the water decreases to a depth of 300 feet. From this level to the bottom, the temperature is uniformly 39°F.

Landing upon Wizard Island we find that the waves lap against a lava flow that encircles the island. The slope of this is most gentle on the west. The soundings show that the only shallow part of the lake surrounds the island and therefore it is likely that the flow of lava is responsible for the shallowness of the water. Clambering over the blocks of lava we soon reach a steeper slope which is largely composed of cinders. The climb to the summit gives one considerable exercise as no definite trail can be maintained in the loose materials. That two or three centuries at least have elapsed since the firey flood poured down the slopes of this volcano, is evidenced by the forest trees now growing here.

Wizard Island rises 763 feet above the level of the lake. The climb to the summit can be made in half an hour although a longer time should be taken. From the top we look down into a gloomy pit, the crater of the volcano. It is about 150 feet in depth. The descent can easily be made. Most of the surface is cinder covered. At the bottom is a basin-like depression perhaps twelve feet in diameter. There is no vent of any kind to be seen.

What was the origin of the basin that holds beautiful Crater Lake? The mountain in the top of which the lake is situated, is clearly an old volcano. The basin was formed by a blowing out of the top of the mountain or by a subsidence. Many years ago Diller pointed out that had the basin originated in the first of these ways, the rim would of necessity be covered by a vast quantity of the fragmental materials ejected. From our boat we observe that this is not the case. Instead, we see sheets of lava dipping outward and some glacial material.

It seems that this basin, or caldera, was formed through subsidence. About fourteen cubic miles of material would be required to fill the caldera. How many additional cubic miles were engulfed is not known, for the height of the majestic mountain that once towered above the present lake can not with certainty be stated. As the lava that poured out here is similar to that which has issued from Mount Shasta, and as the diameter

of Mount Shasta and that of the caldera are essentially the same at the level of 8000 feet, geologists believe that the partially destroyed mountain rose to an altitude of about 15,000 feet.

That a lofty mountain *did* exist here is shown by the glacial striae upon the rocks even at the crest of the rim and by the glacial material on the lower slopes and in the valleys. Unless a mountain once towered above the basin now occupied by the lake, there would be no means of accounting for these. Even were the rim above the snow line, which it is not, a glacier could not form at the very edge of the rim.

Additional evidence of the existence of a lofty mountain is found in the valleys of Sand and Sun Creeks which extend to the rim, forming depressions in the cliffs although their streams begin some little distance below the cliffs. These valleys were formed by ice and water coming from a much higher level. To this partially vanished mountain the name of Mount Mazama has been given. It is believed that Wizard Island and one or two volcanoes that do not rise above the level of the lake, were formed after the engulfment of the mountain.

For the accommodation of visitors at the lake there are comfortable tents with board floors and a large dining room which serves as an assembly room also. The rates are $3.25 per day. A commodious stone hotel, which will no doubt be open in 1915, is now being erected upon the rim. The government is constructing a splendid road through the national park and this will make this part of the trip easier than it is at the present time. The entire trip from Klamath Falls to the lake can be made in one day.

Visitors going to Crater Lake from points north of the California line can leave the Southern Pacific at Medford or Ashland, Oregon. From Medford a road follows the picturesque valley of the Rogue River and enters the national park by what is called the West Entrance. During the tourist season, June 15 to September 30, there is a daily auto service from Medford. Each year Crater Lake is being visited by a larger number of persons and all who see it agree that it is one of the wonders of our country.

Ginn and Company have recently brought out the second in their series of *Industrial Studies* by Nellie B. Allen of the Fitchburg, Mass., State Normal School. A volume of 335 pages devoted to *Industrial Studies, United States,* appeared in 1910. The new volume is devoted to Europe. These books are more than supplementary readers; they contain maps, topics for study, lists of geographical names for practice in spelling and pronunciation, and many good illustrations. It is clear that the different "studies" are chosen by a person who understands what children are interested in,—for example, "Portugal and its Cork Forests," "Germany and her Toys and Canaries," "Spain and Olives."

THE DIAMOND MINES OF SOUTH AFRICA *

THE famous diamond mines of South Africa are in the neighborhood of Kimberly, De Beers, Dutoitspan, and Wesselton. Kimberly is practically in the center of the present diamond-producing area. Besides these mines others of some importance in the Orange River Colony are known as Jaggersfontein and Koffyfontein, Lace, and Monastery, besides two new mines, the Roberts-Victor and the Voorspoed.

The areas of the mines are:

Kimberley	33 acres
De Beers	22 acres
Dutoitspan	45 acres
Bultfontein	36 acres

In 1907 the total number of carats raised from these mines was more than two million and a half, the sales of which realized over $30,000,000.

The most important mine outside the Kimberley group is the new Premier Mine, about 20 miles West-North-West of Pretoria, where the famous Cullinan diamond was found.

The Pipes or Craters

The five diamond mines or craters are all contained in a circle 3½ miles in diameter. They are irregularly shaped round or oval pipes, extending vertically downwards to an unknown depth, retaining about the same diameter throughout. They are said to be volcanic necks, filled from below with a heterogeneous mixture of fragments of the surrounding rocks, and of older rocks such as granite, mingled and cemented with a bluish-colored, hard, clayey mass, in which famous blue clay the imbedded diamonds are hidden.

Besides diamonds, there have been detected more than eighty species of minerals in the blue ground. The blue ground does not show any signs of passing through great heat, as the fragments in the breccia are not fused at the edges. The eruptive force was probably steam or water-gas, acting under great pressure, but at no high temperature.

Before the discovery of the mines there was nothing in the superficial appearance of the ground to indicate the treasures below. Since the volcanic ducts were filled with the diamantiferous ground, denudation has planed the surface and the upper parts of the craters, and other ordinary signs of volcanic activity have been smoothed away. Other hoards of diamonds may also be near. Where there are no surface signs, and the pipe itself is hidden under 10 or 20 feet of recent deposits, it is impossible to prospect the entire country. Accident has hitherto been the chief factor in the discovery of diamond mines.

*Abstracted from Sir William Crookes' little book on "Diamonds" (1909), Harper and Brothers, New York. The book is one of "Harper's Library of Living Thought."

How the great pipes were originally formed is hard to say. They were certainly not burst through in the ordinary manner of volcanic eruption, since the surrounding and enclosing walls show no signs of igneous action, and are not shattered or broken up even when touching the "blue ground." It is pretty certain these pipes were filled from below after they were pierced and the diamonds were formed at some previous time and mixed with a mud volcano together with all kinds of debris eroded from the rocks through which it erupted. *

Kimberley Mines at the Present Day

The De Beers Consolidated Mines, Limited, was founded in 1888 mainly through the genius of the late Cecil John Rhodes, for the purpose of acquiring all-important diamond-mining interests in the Kimberley area and thereby controlling the output. The two richest mines, Kimberley and De Beers, have been actively worked ever since, and have been the main contributors to an output which now realizes over thirty million dollars annually. The success of the consolidation is proved by the fact that since it was brought about, $120,000,000 have been paid in dividends to the shareholders, and it is roughly estimated that 40,000,000 carats of diamonds have been produced, of a total value of over $400,000,000. (1908).

The Compound System.—With gems like diamonds, where so large an intrinsic value is concentrated into so small a bulk, it is not surprising that robbery has to be guarded against in the most elaborate manner. The illicit diamond buying (I. D. B.) laws are very stringent, and the searching, rendered easy by the "compounding" of the natives, is of the most drastic character. It is in fact very difficult for a native employee to steal diamonds.

The Depositing Floors.—Owing to the refractory character of blue ground fresh from the mines, it has to be exposed to atmospheric influences before it will pulverize under the action of water and mechanical treatment.

The depositing floors are prepared by removing the bush and grass from a fairly level piece of ground; this ground is then rolled smooth and hard. The floors extend over many square miles of country and are surrounded by 7-foot barbed wire fences, vigilantly guarded day and night. The ground from the Kimberley Mine is the softest and only needs a few months' exposure on the floors; the ground from De Beers is much harder and requires at least six months' exposure, while some ground is so hard that it will not disintegrate by exposure to the weather under one or two years.

For a time the blue ground remains on the floors without undergoing much alteration. But soon the heat of the sun and moisture produce a wonderful effect. Large pieces, as hard as ordinary sandstone when taken from the mines, commence to crumble. At this stage the winning of the diamonds assumes more the nature of farming than mining. The ground is frequently

*This does not fully accord with the views of several geologists who consider that the diamonds are a part of the original volcanic material. *Editor.*

harrowed and occasionally watered, to assist pulverization by exposing the larger pieces to atmospheric influences. The length of time necessary for the ground to weather before it becomes sufficiently pulverized for washing depends on the season of the year and the amount of rain. The longer the ground remains exposed the better it is for washing.

Washing and Concentrating Machinery.—After the blue ground has been weathered for a sufficient time, it is again loaded into trucks and hauled to the crushing machinery. By crushing and washing most of the useless waste is taken out and the mixture of gravel and diamonds remains. From this mixture the rough diamonds must be sorted. For years this was done by hand. Later, after months of experimentation, an automatic sorting process was discovered. The remarkable discovery was made that diamonds alone of all minerals contained in the blue ground will adhere to grease, and that all others will flow away as tailings over the end of the percussion table with the water. Now all the sorting (except for the very coarse size) is done by these machines, whose power of distinction is far superior to the keenest eye of the native.

The discrimination of this sorter is truly marvelous. Native workers, although experienced in the handling of diamonds, often pick out small crystals of zircon, or Dutch boart, by mistake, but the senseless machine is practically unerring.

Varieties of Diamonds

Diamonds occur in all shades, from deep yellow to pure white and jet black, from deep brown to light cinnamon, also green, blue, pink, yellow, orange, and opaque.

The diamonds from each mine have a distinctive character, and so uniform are the characteristics that an experienced buyer can tell at once the locality of any particular parcel of stones.

Noteworthy Diamonds.—Prodigious diamonds are not so uncommon as is generally supposed. Diamonds weighing over an ounce (151.5 carats) are not infrequent at Kimberley. Some years ago, in one parcel of stones, I saw eight perfect ounce crystals, and one stone weighing 2 ounces. The largest diamond from the Kimberley mines weighed nearly 4 ounces troy. It measured one and seven-eighths inches through the longest axis and was 1½ inches square. The diamond, called "Cullinan" was presented to King Edward on his birthday by the people of the Transvaal. It weighed no less than 1.37 lb. avoirdupois. It was a fragment, probably less than half, of a distorted octahedral crystal; the other portions still await discovery by some fortunate miner.

We are requested by the North Star Woolen Mill Co., Minneapolis, to state that the educational exhibit furnished by them to schools has a nominal charge of 25 cents. They were erroneously referred to in the Sept., 1912, JOURNAL as the Lone Star Woolen Mill Co.

THE EMERALD MINES OF COLOMBIA

THE best emeralds of the world come from the Republic of Colombia, in South America. The famous emerald of the Duke of Devonshire is a Colombian, as is also the equally famous stone in the Hope collection.

This source of emeralds was known almost immediately after the discovery of America, for the native peoples had used the stone in their own way in some cases considering them as precious, with a strong religious significance.

Colombia supplies by far the larger quantities of emeralds. The Government does not, however, admit this mining as an open industry, restricting the deposits in the country to Government control and monopoly. The chief areas in which emeralds are found are near Bogota, the capital of the Republic, Coscuez, being one, and the better known Muzo, another. At present the concession is held by an English company, which can work the mines for 20 years, but may not extract more than the value of $1,250,000 a year, as it is thought that by this means a depreciation in the market may be prevented.

As a mineral the emerald is a silicate, the combination being with oxides of aluminum and glucinum. Other stones have the same chemical combination, the difference in color being produced by varying proportions of the ingredients, and the value placed upon any one of them—emeralds as well—depending upon the intensity of color. Chemically the emerald has about 68 per cent of silica, 15 to 18 per cent of alumina, say 15 per cent of glucina, and small proportions of iron, lime, and chromium oxide. Much of the green depends upon the amount of chromium. The specific gravity is from 2.577 to 2.725, and its hardness is much less than that of the topaz.

A fine stone of 5 carats will cost about $5,000, but such an emerald is rare. Others of less brilliancy and weight are of course of less worth. The emeralds from Muzo are celebrated for their color and "water," their clearness.

The deposits are found in horizontal layers embedded in fossilized bituminous substance, and when first exposed to the air are relatively soft. They harden, however, as time goes on. There are several groups of deposits, all within 100 miles of Bogota, but each group covers quite a superficial area, and no one of them lies at a lower level than 2,000 feet above the sea or at a greater than 7,000 feet. From May, 1904, to February, 1905, the production from Muzo (the only mine then worked) was 262,548 carats of first quality, 467,690 carats of second quality, 22,700 carats of third quality, and 16,000 carats of fourth quality, with a total value of $900,000.

The Muzo group is called the "Mina Real" (Royal mine), and has been worked from time immemorial, but a Spanish soldier, Juan Penazon (or Penajos) definitely located them in 1558. The first scientific examination

was made in 1704. A report from the English company states that the cost of mining is about $97,000 a year, not including the payment for the monopoly. The number of workmen has been upward of 300, varying according to the company's activity. Some stealing goes on, one estimate placing it as high as 25 per cent of the output. Although, including pre-Colombian mining and what has been extracted within the last four centuries, great quantities of emeralds have been sent all over the world, from the great extent of the areas containing deposits and the innumerable ramifications of the strata in which emeralds are found, it would seem quite within reason to hope that the supply of the beautiful precious stone will not be exhausted for many generations yet to come.—[*Bulletin Pan-American Union.*]

ABOUT SUGAR

THE average consumption of sugar per capita has nearly doubled in the United States since 1881. It is now 80 pounds a year, making a total of 8 billion pounds.

Fifty-five per cent of the sugar used in the United States comes from foreign countries, 23 per cent from domestic sources and 22 per cent from our insular possessions—Hawaii, Porto Rico, and the Philippines.

Two-thirds of the beet sugar produced in the United States comes from California, Colorado and Michigan.

Substantially all of our domestic cane sugar is produced in south-eastern Louisiana.

An acre of Louisiana cane produces 2,500 to 3,000 pounds of sugar. An acre of beets produces about the same amount; an acre of cane in Hawaii produces from 8,000 to 10,000 pounds of sugar.

We import practically no refined sugar; it is received in the raw state. The United States is the world's greatest importer of this commodity.

A little more than half of the world's output of sugar is from cane.

About 80 per cent of the sugar which we import from foreign countries comes from Cuba.

Two-thirds of the imported sugar enters the port of New York and is refined in or near New York City.

In the order of production, the leading five cane sugar producing countries are British India, Cuba, Java, Hawaii, and Porto Rico—four of them islands. The leading five beet sugar producers are Russia, Germany, Austria-Hungary, United States, and France.

While British India ranks first as a sugar producer, it ranks 22nd as an exporter, and third as an importer; in other words, in addition to its own production of 2½ million tons, India uses 600,000 tons of imported sugar. China, on the other hand, uses only about 1½ pounds per capita annually.

R. H. W.

GEOGRAPHICAL ITEMS OF INTEREST

Possible Agricultural Developments in Alaska

Alaska lies between latitude 51° 20′ and 71° 20′ N., and longitude 130° W. and 175° E.

Seattle is 400 miles nearer to Eastport, Me., the easternmost point of the United States, than to Attu, the extreme western point of Alaska. The meridian of longitude passing through Attu also passes through New Zealand.

The coast line is 26,000 miles long. On the south coast there are numerous deep, land-locked, ice-free harbors.

The total length of the navigable rivers is 6,000 miles. The length of the Yukon is 1,500 miles from the mouth to the Canadian boundary and is navigable by large steamers for 500 miles above that point. It drains an area of 200,000 square miles.

Alaska has an area of 586,400 square miles, of which 100,000 square miles are susceptible of agricultural use—tillage and grazing. Probably 30,000 square miles, or 5 per cent of the total area, can be made available for tillage.

Four-fifths of the possible tillage area is in the Central Plateau, of which the Tanana Valley offers the largest opportunities for farming. The Cook Inlet region has 3,000 square miles of tillable land, the Copper River drainage 2,000 square miles, and there are 1,000 square miles on the south coast, including the southeastern and southwestern projections.

It is not to be understood that the land in these areas is of such character that every half section is a possible farm home. Excepting in the alluvial-deposit areas bordering the larger streams, the topography of the possible tillable land is hilly, and in selecting homesteads care must be taken to secure a favorable slope, so as to get the full advantage of exposure to the sun. Apart from the bottom land there are few half sections all of which may be tilled, and homesteads will not be joined one to another, as a rule, but will be separated by land unfit for farming.

Alaskan soils have been formed largely from material produced by glacial action and from alluvial deposits. Gravel beds occur frequently, and these are often thinly covered with soil. Shallow lakes and lake beds abound and in the latter the accumulation of partially decayed vegetation has been transformed into peat. Where the vegetation has fully decayed there is a rich black loam.

Because of the protecting coat of vegetation and the short melting season, the frost line in the soil lowers only a few feet during the summer, thus preventing the escape of the excess of soil moisture and, together with the low temperature, the decay of vegetation. This results in a very wet, mucky, and sour condition of the soil. Consequently, much of the land before it can be made to produce cultivated crops must be drained and cleared of the pro-

tecting coat of moss and other vegetation, in order to permit the heat of the sun to lower the frost line. Lime is very generally needed as a corrective of the acidity of the soil.

Practically all of the tillable land in Alaska must be cleared of a growth of timber and moss at heavy cost.

The climate of Alaska varies greatly. On the south coast the summers are cool and the winters mild, the mean annual temperature at Sitka being about that of Washington, D. C. Zero temperatures are the exception. Precipitation is heavy, and there is much cloudy weather that is not favorable to tillage other than the growing of vegetables and grasses. The high mountains fronting the south coast intercept the moisture-laden clouds coming from the sea and cause the excessive precipitation at low levels and the permanent snow and ice fields at the higher levels.

The central plateau, consequently, has a much drier climate and a much greater range of temperature, with warmer summers and colder winters. The summers are short as to number of days, but, with 18 to 20 hours of sunshine in each 24 hours during the growing season, vegetation develops very rapidly. The winter temperatures are very low, but with dry, still air and clear weather much of the time, particularly in the upper portion of the Yukon drainage.

The flora is rich and varied. It includes 100 species of grasses, many of which are of large agricultural value for hay and silage and for grazing. The mosses and lichens of the tundra regions of western and northern Alaska are an important source of food supply for domesticated and native reindeer.

Among the native edible fruits that are plentiful are currants, gooseberries, strawberries, cranberries, blueberries, and raspberries.

Timber in the humid south-coast area is dense and of large economic value. In the central plateau it is sparse and small, but ample for local needs if it can be conserved. Of the Coniferae, spruce predominates. The balm of Gilead and quaking-asp poplars and white birch are the representatives of deciduous trees. Willow and alder thickets are widespread. There are 100,000 square miles that may be classed as timberland.

Among the fauna are the king of carnivorous animals, the Kodiak brown bear, and many other species of bears; the moose, the largest of his kind; the caribou or native reindeer that exist in large herds; mountain sheep and goats; deer; numerous fur-bearing land and sea animals; myriads of land and water birds, this being the nesting place of many of the latter; and fish in such variety and number as to make the fisheries of Alaska among the greatest in the world.

The mineral resources are vast, varied, and widespread. Gold, copper, and coal are of the greatest importance. Gold and coal are very widely disseminated. Rich bodies of copper ore have been located in the Prince William Sound region and in the Copper River drainage.

Alaska's agricultural possibilities have been in process of demonstration for 15 years by the Office of Experiment Stations of the United States Department of Agriculture, during which time experimental work has been carried on in Sitka (the headquarters station), Copper Center, Kenai, Kodiak, Rampart, and Fairbanks, besides the work done by individuals on homesteads, at schools, and at missions. The result of this effort has been to prove that hardy vegetables, small fruits, and forage crops can be successfully grown over a wide area and that dairying, poultry keeping, and stock raising are promising industries. There is ample pasturage in the tundra regions of western and northern Alaska for many thousands of reindeer.

Alaska's present population of 65,000, including natives, does not afford sufficient home market to warrant large agricultural development, especially in view of the great cost of clearing and preparing land for tillage.

The Federal homestead laws extend to Alaska, excepting that, instead of 160 acres, 320 may be filed upon. Very little of the available land has been surveyed, but that work is now in progress. One may locate on unsurveyed land, file a claim, and establish lines by metes and bounds, but he can not secure a title until a survey has been made by an authorized surveyor and the survey approved. If the survey is made in advance of that made by the Government, it is done at the expense of the homesteaders, and that is heavy.—[*Summary, Bull.* 50, *U. S. Dept. Agr.*]

Rainfall and Spring Wheat

A statistical study has recently been made* to determine whether or not there is a definite correlation between wheat yields and rainfall. In the wheat districts of southern Australia there is a practically constant difference of six between the rainfall in inches and the yield of wheat in bushels per acre. The relations between climate and crops are, in general, much more complicated, and no one climatic element has such a predominating influence as precipitation in the case cited above. Nevertheless the supply of moisture during the growing season is one of the largest factors in the production of the staple crops of all countries. In Minnesota and the Dakotas, the region covered by this investigation, wheat is seeded during April and harvested during the latter half of July and in August. There is always sufficient moisture in the ground in April to start the plant, and by July it has attained its height and is heading, at which time warmth and sunshine are needed and much rainfall is injurious. It is during May and June therefore when the plant is growing most rapidly, that the favorable effects of precipitation should be most noticeable.

Figures for South Dakota show a remarkably close correspondence between yield and rainfall for several of the years, but considerable divergences in other years; the same is true of North Dakota, while Minnesota shows

*Blair, T. A., "Rainfall and Spring Wheat," *Monthly Weather Review*, October, 1913, pp. 1515 to 1517.

more marked divergences and less correlation. In particular, the four wettest seasons in Minnesota, in which the rainfall exceeded ten inches for the two months under consideration, each produced a crop that was below normal, while of the six years with yields decidedly above normal five had less than the average precipitation. It appears therefore that a wet May and June are distinctly unfavorable for wheat in Minnesota and that the best crops are obtained when the precipitation is normal or slightly less. One evident reason for this is the poor drainage of much of the land in Minnesota. Many fields produce better in dry years because, even in years of ordinary rainfall, they become waterlogged through lack of natural drainage. No such result appears in the Dakotas, where the drainage is better and where also the average precipitation is less, approaching more nearly a semi-arid condition, and where for this reason a more direct response to increased rainfall might be expected.

A similar study was made in Russia ** with approximately the same results. Out of eleven years of observation the two with the yields farthest below normal had the rainfall farthest above normal, while the three years with yields farthest above normal had rainfall which was normal or slightly below. The author concludes that it is as a rule impossible to draw absolute conclusions based on the value of a single factor. He suggests that there is an item which, although registered in meteorological tables, is almost always neglected both as regards itself and as regards its relation to the other items. This is the evaporating power of the soil and of plants, which is often two or three times as great as the atmospheric precipitation.

V. C. FINCH.

THE SHIFTING OF CLIMATIC BELTS

Under this title, Professor Penck, of Berlin, discusses in the June *Scottish Geographical Magazine* the world-wide evidences of climatic changes during the glacial period. From this article, in reality an address delivered before the society, the following interesting excerpts are taken:

"We cannot regard glaciation during the Ice Age as due to local conditions, but must consider it in relation to a universal alteration in climate."

"All this leads us to assume that the area of extreme aridity in Africa once lay much nearer the equator than it does today, exactly as was the case in both Americas, and, guided again by the phenomena of the Great Basin, we may fix this period in the Ice Age. The Great Ice Age presents itself then neither as a period of extreme cold—as was originally held—nor as a period of excessive humidity over the whole earth, but as a period during which the climate belts were shifted into lower latitudes. During this period

**Nerucev, M., "On the Estimation of Humidity in Agricultural Meteorology," abstracted in the *Monthly Bulletin of the Bureau of Agricultural Intelligence and Plant Diseases*, April, 1912, p. 862.

the great arid regions of the world lay some 4 or 5 degrees nearer the equator, while the snow-line was found more than 3300 feet lower."

"The 4000-foot snow line which today runs along the west coast of Norway . . . extended 17° farther south than now—roughly some 1200 miles. Eastward the shifting is still more remarkable, for the line traversed the Urals during the Ice Age in 62° N. lat.—a point some 1400 miles from its present position."

"Similar has been the shifting of the 4000-foot snow-line on the west coast of South America. Today it is found in the extreme south of Patagonia. During the Ice Age it was situated about 42° S. lat., some 900 to 1000 miles nearer the equator . . . The 6000-foot snow-line which we find today in Central Europe was shifted during the Ice Age, at most some 700 miles farther south. . . ."

"The fact that the snow-line in the arid region was specially high during the Ice Age, affords a new ground upon which opposition may be offered to the theory that the Ice Age was a period of excessive humidity, for had it been so the arid areas of the earth would have shrunk, and the snow-line in these areas would have descended to a specially great extent. As this is not the case, we may conclude that the Ice Age was rather a period of low temperature, and that this low temperature was universal throughout the world. For had the lowering of the temperature occurred on only one or the other hemisphere, as is demanded by Croll's theory, then the depression of the snow-line at the equator would not correspond as it does to the depression in temperate latitudes."

"A general lowering of temperature, however, would bring about not only an advance in the snow-line, but at the same time a shifting of all climate belts equatorwards. If the heat supply of the earth decreases, the atmospheric circulation will become less intense. The great areas of high pressure will become weaker, and the horse-latitudes must move towards the equator. And it is they that determine the position of the arid areas upon the land masses. Thus, everything points to the fact that the cataclimate of the great Ice Age was a period of reduced heat supply on the whole earth."

"The shifting of the climatic belts, however, during the Ice Age, has never gone so far that one belt has entirely usurped the position of another. Rather we meet everywhere with *constant regions,* where the climate has remained unaltered, where there has always been a snow, a humid, or an arid climate, and *shifting regions,* where snow and humid, humid and arid, and arid and humid, have alternated."

"But the main fact remains unaltered that during the Ice Age the essentially tropic zone was smaller than at present. The arid areas of the northern and southern hemispheres approached one another, and in this shrinkage of the tropical humid zone the influence of an Ice Age in lower latitudes would be most clearly reflected. . . ."

Physiographically Unfinished Entrances to San Francisco Bay

Under the title "Physiographically unfinished entrances to San Francisco Bay, R. S. Holway of the University of California has discussed (*Uni. of Calif. Publications in Geog.*, Vol. 1, pp 81-126) the origin of seven low passes through the Coast Range of California which a comparatively slight subsidence of 350 feet, would convert into entrances of San Francisco Bay. Evidence is presented to show that the Bay occupies a part of a longitudinal valley formed by the folding of the Coast Range. This valley does not all drain into the bay. Both ends have outlets to the sea through narrow gorges. Only one, however, of the low passes to the ocean, termed "unfinished entrances," is of structural origin. This is the Merced valley, just south of San Francisco.

Of the other valleys, Liberty Gap is classed as an area not much uplifted at the time of the formation of the Coast Range and subsequently trenched by streams, reaching to the ocean. The origin of Lagoon Pass and Elk valley, the two depressions between Liberty Gap and Golden Gate is less clear. Holway classes them as remnants of the valleys of streams which once flowed directly to the ocean but were diverted by the formation of the San Francisco Bay valley. An alternative is to suppose them to be due to the meeting of the headwaters of streams developed under present conditions. This hypothesis is not in accord either with the low grade of the passes or the directions from which tributaries enter the main valleys, both of which indicate a reversal in stream direction in the eastern portion of these depressions.

Russian River, which drains the north portion of San Francisco Bay, Golden Gate, and Pajaron Canon are held by Holway to be the valleys of rivers which maintained their courses during the uplift of the range. Both these streams are separated by very low divides from the bay drainage but turn abruptly into the mountains and reach the sea through canons. To check the idea of persistence rather than diversion through capture by streams working back from the ocean, the fish of the different drainage basins were compared. It is stated that no evidence was found to show the recent passage from one basin to another of any species except some small ones which inhabit the headwaters. These might pass the divides through the shifting of tributaries on their alluvial cones so that they have changed from one drainage system to another. Another line of evidence showing that the breaks in the range are due to persistence and not capture or overflow of the range, is that they do not occur at the lowest points or in the structural depressions like Merced valley. The great depth of Golden Gate is explained by the large size of the Sacramento River by which it is believed to have been eroded. Carquinez Strait which joins San Francisco Bay with the great interior valley of California is believed to have also had the same origin.

F. T. Thwaites.

Central Arabia

Captain Leachman in a description of a camel trip through Central Arabia, published in the *Geographical Journal* for May, gives some interesting bits of information in reference to that little known country. As to the climate he says, "Bitter cold was experienced in the plains in the winter and the water skins were frequently frozen hard in the morning—so much so that we had to thaw them by the fire before loading, or otherwise they would rub sores on the camel's hide."

As to the ways and endurance of camels in desert work the following extracts are interesting: "Here—at the desert wells—the camel drinks, in itself a somewhat remarkable sight, as however thirsty he may be, it is done in the most leisurely fashion, and he appears to taste the full joy of a long drink in the manner of a gourmet born. He first wets his lips and again raising his head proceeds to shake it and look about him. After a pause he drinks a little more, and the same process is repeated, and thus each drop of the precious liquid is absorbed with appropriate relish. In the winter a camel will last seven days without water and without great discomfort, while in the spring when the green grass appears, he will drink but rarely, and remains often a couple of months waterless."

The Bedouin is extraordinarily kind to his camel and in return the Arabian camel is a very different animal from the ill mannered and treacherous variety encountered in India. His powers of endurance are extraordinary and some of the stories of great journeys done by camels are almost beyond belief. The camel rider, whose duty it was to carry the post from Damascus to Baghdad, generally covered an average of sixty miles a day for nine days. Burkhardt has a story of a camel who covered 115 miles in eleven hours.

R. E. Dodge.

Movement of Water in the Japan Sea

A recent number of the Tokio geographical magazine contains something that may be of interest and I am going to send you its review.

A hydrographer carried on his experiment in Japan Sea after the war with Russia, floating 750 bottles in all and obtained the following results. He recovered 16 per cent of the total number of bottles he floated. During Japanese Russian war Japanese set 840 mines at the mouth of Vladivostok under the cover of the night, and it is possible that Russians placed three times as many as we did. 306 submarine mines after having gotten loose in some way were washed ashore or were picked up along the provinces on Japan Sea. An interesting thing is that where a great number of mines were washed ashore there were recovered the greater number of bottles. One exceptional case is that one of the bottles reached Tokio Bay after 204 days. It is therefore evident from his experiment that there is a regular circulatory current being set up in Japan Sea which goes round counter clockwise.

George Nishihara.

Trade on the Yenesei River

The Yenesei is the fifth longest river in the world with a length of about 2900 miles. It is very rarely narrower than half a mile and for a distance of three hundred miles from its mouth it varies in width from ten to thirty miles. On the lower reaches the goods are transported in barges towed by tugs. From the upper parts of the river rafts are sent down simply drifting with the current. There is a kind of barge which is used for drifting purposes and these are usually sent from the more cultivated districts on the upper part of the river loaded with various necessaries of life and broken up at their destination which is north of the tree boundary. The material thus obtained is used for the erection of houses.—[*Geog. Journal, May,* '14.]

R. E. Dodge.

Variations in Temperature of Hot Springs in Japan

Arima Hot Spring near Osaka shows from its historical records of more than 300 years that the temperature of the spring has not been constant. A recent investigation has revealed that at the time of earthquake the temperature rises suddenly and the water becomes too hot to be bathed in. At present it is 49-54 degrees C. I think this has some important bearing upon the question of the subcrustal portion of the earth. The earthquake must be therefore due to some movement of molten rocks underlying there and not to adjustment of sliding blocks. It shows that the molten rock is not very far below the zone of the ground water. It also shows that the rock may remain in molten condition at comparatively shallow depth. There are no active volcanoes near there, and it is strange to see how long this thin crust over nature's crucible can stand without being broken.

George Nishihara.

The Use and the Waste of Wood

Sawdust is now becoming of sufficient value to ship it to points where it can be used for ice packing, stable bedding, stuffing for upholstery, packing glassware, for shipment of metals, crockery, etc. Sawdust is even used for the manufacture of gunpowder and in Europe it is compressed into briquettes and sold for fuel. A few plants have already been organized in this country for utilizing sawdust for briquettes. Slabs, edgings and tops are now being profitably converted into cooperage stock, broom and other handles, wood turnery, wooden dishes and novelties, dowels, furniture rounds, etc.

Lumbermen and others have shown recently that only 40 per cent of the trees cut in the forests of this country are used for lumber. The remaining 60 per cent represents pure waste as high stumps and tops either left to rot in the woods or as slabs consumed in the burner or slash piles at the mill. In Germany about 95 per cent of every tree grown in the forests is used. Practically nothing from the forest is allowed to go to waste, even the stumps are grubbed out and the twigs and branches tied up into faggots for fuel.—[*American Forestry.*]

THE BALKANS AND TURKEY

(Excerpts from article by C. H. Bellamy, *Jour. Manchester Geog. Soc.*)

The Balkan Peninsula has been in modern times what the Low Countries were in the Middle Ages—the cockpit of Europe. It is there that the eternal Eastern question had its origin; it is there, too, that the West and the East, the Cross and the Crescent, meet. But to understand the great problems which still await solution in South-eastern Europe, and are once more pressing themselves upon the attention of all thoughtful men, it is important to have some knowledge of Balkan history. The mutual jealousies of Bulgaria and Servia, the struggle of various races for supremacy in Macedonia, the alternate friendship and enmity of the Russian and the Turk, are all facts which have their root deep down in the past annals of the Balkan States. Few persons in Western Europe seem to remember what has never been forgotten in the Peninsula,—and this is forced upon you over and over again as you visit their towns—that there was a time when the Servian and Bulgarian Empires were great Powers, and their respective rulers governed with the proud title of Czar a vast realm, which is still the dream of patriots.

The Bulgarian Empire of nine hundred and a thousand years ago, under the Czars Simeon and Samuel, ran from Mesembric, on the shore of the Black Sea, to Mount Rhodope, and then right across the Peninsula from Mount Olympus to the Albanian coast opposite Corfu. With the exception of a few ports, all Albania was Bulgarian, as was also nearly the whole of the present kingdom of Servia. Before the Magyar invasion Czar Simeon seemed to have included part of Roumania in his dominions, and it is possible that portions of Hungary and Transylvania owned his sway. Bulgaria under his auspices, was—what she has never been again, but what she still aspires to be—the dominant state of the Balkan Peninsula.

Then, like a page of romance, we learn how this mighty empire crumbled away before the assaults of its enemies, and came under the power of the Greek Emperors; and how, one hundred and sixty-eight years later Bulgaria was delivered by John Asen, who founded and consolidated the second Bulgarian Empire, of almost equal territorial importance to the first.

After the lapse of two centuries this empire fell, and the nation came under the domination of the Turks for nearly five hundred years. In the early part of the nineteenth century the revival of the spirit of independence began. One result of the Turco-Russian War was the constitution of the principality of Bulgaria, and the autonomous province of Eastern Roumelia, and the election by the National Assembly at Tirnova in 1879 of Prince Alexander of Battenberg as their first Prince.

The Bulgars are a fine race of men, especially the hearty young countrymen in homespun garments and hide sandals, all well clad, clean-limbed, upstanding young fellows of eleven or twelve stone, with healthy, smiling faces. The peasant people own the land which they till so carefully. Even

amongst the poorest in the villages it is the exception to find a man who is not a landowner.

Bulgaria is one of the greatest rose gardens of the world. Few parts of Europe have been so often laid waste; in few has the ground been so plentifully drenched with blood, century after century. In none, perhaps, have so many different races fought for the mastery. But when the warlike storm has spent its force fresh roses spring up, filling the land with fragrance and bringing a rich material reward to its children. Some of these rose gardens are sixty miles long, and from them the world gets its principal supply of attar of roses.

Sofia, the capital of Bulgaria, is one of the cleanest cities in Europe. All the principal streets are paved with tiles, the shape and size of a brick, and they appear to stand the traffic admirably, and all of these streets have electrical trains running through them. Sofia is the only town in the country of over 50,000 inhabitants. In 1887 it was estimated to have a population of about 20,000, whilst to-day (that is, before the war) its inhabitants number about 100,000; and in these twenty-five years it has been completely metamorphosed, the same quarter of a century having entirely changed the country. Then, there were no railways in Bulgaria proper—only some two hundred miles of line, constructed under the auspices of the Turkish Government, were open to traffic in Eastern Roumelia—now Bulgaria possesses some twelve hundred miles of railways, besides nearly two hundred under construction.

Nor does the history of Servia lack its romance. Out of a loose federation of chiefs the Servian monarchy was gradually developed, its golden age beginning with the accession of Stephen Dusan in 1336. Never has the power of Servia been so great or the Servian dominions so vast as under the sway of this mighty ruler, who raised his country to the rank of an empire, equipped it with a complete code of laws, and made it respected all over Eastern Europe. Under the weak rule of his son his empire slowly melted away, and in the struggle with the Turks the Servians were vanquished at the famous battle of Kossovo, on June 15, 1389, a battle which for five centuries decided the fate of the Balkan Peninsula.

In the first quarter of the last century Servia began to feel after her lost independence, and in 1817 Milosh Obrenovic was elected Prince of Servia, which dignity lasted in his family until it was exchanged in 1882 for the title of King.

Nor are the histories of the other Balkan States wanting in romance and interest. Roumania, the name adopted at the union of the two principalities of Wallachia and Moldavia, has been subject to Hungary and Poland, to Austria and Russia, as well as Turkey; and only emerged from the supremacy of this latter Power in 1859, the caping-stone of Roumanian independence being set by the proclamation, on March 26, 1881, of Prince Charles as King of Roumania.

Bucharest has over 300,000 inhabitants, with many fine public buildings. It is one of the gayest capitals that I know, and in proportion to its size rivals Vienna and Paris in animation, for at midnight it is as lively and gay in the centre of the city as at midday, and some of the cafes never close, day or night.

Bucharest claims that she has got the finest post office in the world, and there is some foundation for her claim. Her streets are being widened and embellished on every hand. The railway system of the country is being reorganized, no expense is being spared, the immense bridge over the Danube being a remarkable engineering achievement. She is exploiting her vast stores of natural oil, and if she has given concessions to foreign companies, they are hedged round with restrictions for the benefit of the country. But, as in many another new country, corruption and bribery are rampant in official circles; the taxes are very onerous, and press heavily upon all classes. However, under the enlightened sway of King Carol, Roumania is working out her own redemption, and with her immense natural resources of oil and magnificent steppes for the cultivation of corn, maize, etc., will undoubtedly occupy a leading place in the Balkan States.

Montenegro was an independent State in the fourteenth century, from which time to the nineteenth, its history has been a record of battles and raids against its neighbours, and at a time when the whole of south-eastern Europe, to the very gates of Vienna was trembling before the Turks, the Montenegrins managed to vindicate and maintain their independence. A new era began with the reign of Peter II., from 1830-51, and the present ruler, now a King, waged successful wars against the Turks, and by the Treaty of Berlin in 1878, obtained full recognition of his sovereignty.

Mediaeval and modern Greece affords the student of history one of the most remarkable romances he can desire. The great Byzantine Empire dwindled away, especially under the inrush of the Ottomans, and in the later middle ages she became subject to the Venetians and other foreign rulers, eventually seeming to lose all national character and spirit under the Turkish subjection.

But her national soul woke in the War of Independence in 1821, and success followed the uprising. King Otho was elected in 1832, and henceforth Greece has existed as a recognized independent kingdom.

About the Turks I need not say much. When they came to Europe they were a great people—a great military people. In manners and customs they were probably not more cruel or barbarous than the peoples they conquered; in the middle ages everywhere folk were cruel beyond belief. In point of power and organization and military skill, however, they were greatly superior, and they were led by Sultans who, in many cases, had a genius for generalship. But beyond conquest they had no ideas. They camped on vanquished territory, and forced the people to feed them, and this policy they have pursued right to our time.

RECENT PUBLICATIONS

RUSSIA OF THE RUSSIANS. By Harold Whitmore Williams. 430 pages: 32 plates and a map in colors. Charles Scribners Sons, N. Y., 1914.

This is the latest or 13th volume in the "Countries and Peoples Series." It is an excellent book, written with full knowledge of the things with which it deals, and is notably free from bias. In chapter I, "The Growth of Russia," the author lays strong emphasis upon the geographical factors. He says, "The fundamental difference between Russian and English History is the difference between the great plain and the island." The bureaucracy, the constitution and the position of the press are treated in a way which enables the American to understand some of the most fundamental differences between the Russian government and the liberal western governments. Of the press, he says, "It is still subjected to a variety of harrassing restrictions, but is freer than it was eight or nine years ago. * * * Public opinion does not find expression to any considerable degree in the Press."

The intimate interaction of church and state are treated. "The Russian heads his letters with a date 13 days later than that recognized by the rest of the civilized world simply because the church insists on the maintenance of the Old Style." The church is a bureaucratic institution and the village priest is made to feel that he is a part of the bureaucracy, a government official.

The chapter on Peasants and Proprietors contains much geographical material: it opens with,—"Russia is an agricultural country *par excellence*. Of its 164 millions of inhabitants three-fourths, or over 120 millions, are engaged in agriculture. It is a country of peasants. The prosperity of the Empire, the state of the budget are dependent principally on the state of the crops. Even the political situation is largely dependent on the harvest." The cities are said to be with difficulty emerging from the market-town stage. The peasants are of infinite variety and of every degree of poverty and prosperity, ignorance and intelligence. Drunkenness is prevalent. The state monopoly of alcoholic liquors yields $400,000,000 in taxes and an abundant harvest of state-made drunkards. There are German and Lettish peasants who prosper greatly on land of the same quality as that on which the Russian peasants merely eke out an existence. The communal system of land tenure is breaking down. Thousands of peasants are emigrating to Siberia and certain Siberian towns are growing rapidly; one town in the Altai region having grown to 80,000 in seven years.

The large estates of the landed gentry are breaking up. "Russian culture was in the first instance and still largely is, a culture of the landed gentry."

The chapter on Trade and Industry is also geographical. Transportation conditions are discussed. "The primary consideration in the construction of many of the chief Russian railways has been strategic, and strategic and economic interests by no means coincide." Of manufacturing, the author

says it is a small thing in comparison with Western Europe. "It lags behind in the application of mechanical power." The final chapter is an excellent description and analysis of St. Petersburg. The book is entitled to recognition as one of the very best on the subject with which it deals.

Iceland, Horseback Tours in Saga Land, by W. S. C. Russell, a science teacher in Springfield, Mass., has recently been published by Richard Badger, Boston, and by The Copp Clark Co., Toronto ($2.00). It is a well organized and well written account of four summers of travel in Iceland. The book is popular rather than strictly geographical, but the author, having considerable knowledge of geography and physiography, has made a book which is much more than a mere traveler's random observations. It is one of those books which both the scientist and the general reader finds satisfying. The book is distributed also by the Cambridge Botanical Supply Co., Boston.

A Book of Discovery by M. B. Synge is among the recent geographical offerings of G. P. Putnam's Sons. It is a 500 page volume giving a history of the world's exploration from the earliest times to the discovery of the South Pole. Each of the 73 chapters deals with a different event or group of events or with the work of a successful explorer. Illustrations are profuse, including half-tones, nine colored plates and reproductions of ancient and mediaeval maps. The book is not a reference work for scholars but is rather, an account of inherently interesting events, written in a simple, easy style well suited to young people. Boys in their teens will read it with eagerness. It is a good book for school libraries and pupils who read it will find geography a more interesting study thereafter.

The Beginner's Garden Book is the title of a 400-page text-book just issued by the Macmillan Company ($1.00). It is written by Allen French and is designed for use in the upper grammar grades. As its title indicates, the book is a hand book in gardening. It divides the work into "Autumn Work," "Winter Work," "Gardening under Glass," and "The Real Garden." Excellent illustrations, review questions, and an interesting manner of presentation are qualities of the book.

Germany of Today is volume 72 in the Home University Library (Holt, 50 cents). It is written by Charles Tower, and is up to the high standard which the series is so admirably maintaining. Its 250 pages can be read at a sitting and when the reader finishes he feels that he has seen Modern Germany through the discerning mind of an author who understands the German people and the German nation. He sees both the weakness and the strength of Germany.

Latin America is volume 78 in the same series. It is written by Professor William R. Shepherd of Columbia. He places the emphasis upon "in-

stitutions and culture," and upon "phases of civilization" in the Latin American Republics. Several of the chapters are geographical; for example, the ones on Geography and Resources, on Industry, on Commerce and on Transportation. The individual republics are not treated separately but their resemblances and differences are brought out by comparison. The terse, crisp style made necessary by the space limitations placed upon the author give the book added value to the busy man who desires to get an authoritative account of Latin America in brief space.

Hardwood Forests of Southern South America

Owing to the fact that leather tanning extracts which formerly came almost entirely from hemlock and oak bark have been largely replaced by quebracho tanning extracts from the forests of South America, the following note will be of timely interest:

The manufacture of the quebracho tannin is conducted in numerous little factories in the forests of the Chaco region, mostly located in the province of Santa Fe, Argentina. The quebracho forests of the north and northeast remain by far the country's most valued supply of hardwoods. Within the past decade the amount of logs exported has increased from 245,000 tons to 445,000, and of extracts, from 9,000 to 84,000 tons. In this great land of forests and glades, rising from the Parana river toward the northwest, some 300 saw mills and extract factories are eating out its vitals, backed by 25,000,000 dollars of capital and $45,000,000 of sales. The largest company employs 4,000 or 5,000 workmen in getting out the timber and transporting it to the saw mills and extract factories.

The greater proportion of the population of the quebracho country are a mixed race of Indians and the whites of all nations. The cultivation of cane and the manufacture of sugar are prosecuted over a large extent of northern and northwestern Argentina, and in these industries several thousand Indians and mixed Correntinos are employed every year as unskilled laborers. Many more work in the quebracho forests. At the end of the sugar season these savage workmen will return to their homes in the Chaco country, traveling sometimes four or five hundred miles over mountains and through swamps and forests. They will then fell the quebracho trees on the banks of the rivers and streams, bind them into rafts with lighter woods beneath as floating buoys, get out fence posts and sleepers and assist in preparing the red quebracho for the manufacture of the tannin extract.

The management of these hardwood industries is chiefly in the hands of Europeans of Latin and German stock, with a threatened incursion by capitalists of the United States. The Farquhar syndicate, a powerful combination of New York moneyed men, is solidly intrenched in Paraguay and southwestern Brazil and is making ceaseless attempts to penetrate the quebracho region of Argentina.—[*American Forestry.*]

A GEOGRAPHY QUIZ ON THE CONTINENTS

1. What land was "The Dark Continent" until a few years ago?
2. What continent is the homeland of Western Civilization?
3. What continent was the last to be discovered by civilized peoples?
4. What continent is inhabited mainly by Spanish-speaking peoples?
5. What continent contains the countries of the Far East?
6. What continent was inhabited only by a black race when discovered?
7. In what continent did the great religions of the world originate?
8. What continent is the home of most people?
9. What continent is governed by rulers or colonists from another?
10. What continent contains the least waste and uninhabited land?
11. What continent has a great desert merging southward through grasslands into dense forests?
12. What continent is a peninsular portion of a larger continent?
13. What continent lies south of the equator?
14. What continent has its larger part north of the equator?
15. What continent extends nearest to the south pole?
16. Which continent of the Western Hemisphere extends farther to the east?
17. Which continent of the Northern Hemisphere extends nearest to the equator?
18. What continent lies north of the tropic of cancer?
19. What continent is east from Central America?
20. What continent extends into both temperate zones?
21. What continent in west longitude is crossed by the tropic of cancer?
22. What continent has the most irregular coastline?
23. What continent has the loftiest, largest highland?
24. What continent has a highland extending from end to end, without any low pass?
25. What continent has no lofty mountains, always snowcapped?
26. What continents have their main highlands in their western part?
27. What continent has lofty mountains but no long continuous highland?
28. Which continent is heavily forested on the western slope of its southern portion?
29. Which on the eastern?
30. Which continent is reached by the equatorial rain belt only in our winter season?
31. Which continent has the greatest extremes in tmperature and moisture between its different parts?
32. Which continent has the longest river system?
33. What continent has the river basin with the greatest total rainfall and outflow?
34. What continent has the most populous flood plains?
35. What continent has the largest freshwater lakes?
36. What continent has the largest salt lakes?
37. What continent produces most corn?
38. Most coffee?
39. Most sugar?
40. Most wheat?
41. Most tea?
42. Most silk?
43. Most of the finest wool?
44. Most flax?
45. Most cotton?
46. Most rice?
47. What continent owns most large ocean steamers?
48. What continent owns most large lake steamers?
49. Which continent has most cities of the first rank in population,—a million or more?
50. Which continent has the greatest railway mileage?

PHILIP EMERSON.